ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1909.

LONDON:
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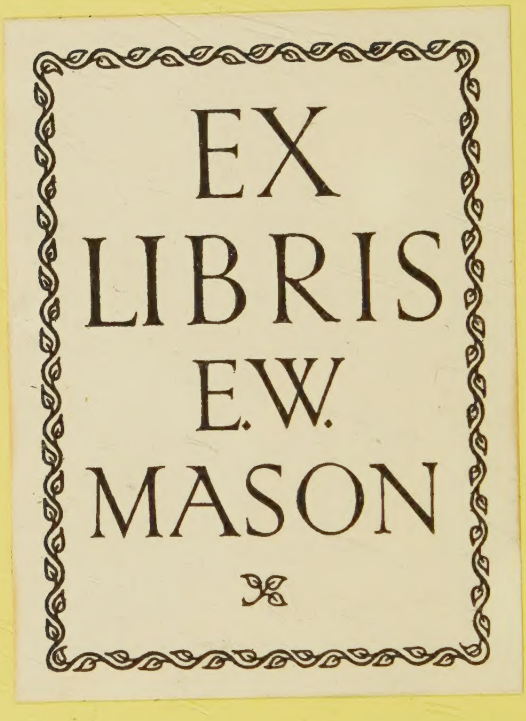
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Errata.

Page 44, line 2 from top, *for* praebeus *read* praebens.
Page 44, line 3 from top, *for* idigena *read* indigena.
Page 60, line 15 from top, *for* glums *read* glumes.
Page 64, line 15 from bottom, for *Ormithidium* read *Ornithidium*.
Page 80, line 4 from bottom, *for* Parlatori *read* Parlatore.
Page 232, line 21 from bottom, *for* 1874 *read* 1784.
Page 240, line 17 from bottom, *for* Montague *read* Montagne.
Page 270, line 18 from top, *for* Steyner *read* Stayner.
Page 342, line 2 from top, *for* J. W. Gallagher *read* W. J. Gallagher.
Page 352, lines 8 and 9 from bottom, *for* Sutton *read* Suttor.
Page 392, line 7 from top, *for* Lancaster *read* Lamastre.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1.] [1909.

I.—ON SOME SPECIES OF IMPATIENS FROM INDO-CHINA AND THE MALAYAN PENINSULA.

J. D. Hooker.

When examining the contents of a rich collection of Chinese *Balsamineae*, liberally loaned to me by the authorities of the Paris Museum of Natural History for the purpose of collating the species with those in the Kew Herbarium, I found amongst them a considerable number that had been collected in the French possessions of Indo-China. These were of special interest as being the only ones known to me as natives of that country.* There were about 16 of them, and they appeared to me to differ so greatly from those of China proper, not only specifically but in sectional and in other characters as to suggest Indo-China being, in respect of *Balsamineae*, a different phyto-geographical area from that to the north of it. Further, a study of the *Balsamineae* of the Malayan Archipelago from Sumatra eastwards to Borneo, Celebes, the Moluccas, New Guinea, and the Philippines, proved that these did not harmonise with those of Indo-China. Two more Indo-Chinese have subsequently been received from the Herbarium of the Fribourg Museum, making 18 species to be discussed here.

To determine the relationship of the Indo-Chinese and Malayan Peninsula species of *Impatiens*, it is necessary to take into consideration those of the adjacent areas of China, Burma (including Assam), and the Malayan Archipelago. Siam should be included were its Balsams known, but only six species have been collected in that kingdom (by Dr. C. C. Hosseus); one of them is also a native of Yunnan, and the others are of Burmese type.

The Balsams of the Himalaya differ so greatly from those of other Indian areas that their inclusion would be valueless. Except

* Loureiro's "Flora Cochinchinensis," published in 1790, when probably the term Cochin-China was not that now understood, contains five species of *Impatiens*, all apparently either Canton or garden plants Two of these *I. Balsamina*, L., and *I. cornuta*, L., are forms of one. The others are too incompletely described for identification. None now exist in the British Museum, where Loureiro's herbarium is deposited.

(12002—6a.) Wt. 35—183. 1375. 2/09. D & S.

the ubiquitous *I. Balsamina*, not a dozen of the 80 or 90 Himalayan species have been collected elsewhere.

Japan, too, is of no account in this study; it presents the unexplained anomaly of containing only two species known to me, namely, *I. nolitangere*, which extends throughout N. Asia and Europe to the Atlantic, and *I. Textori*, Miq., which is also a native of N. China. An explanation may be found in its insect fauna.

The materials from which the following data have been obtained are contained in the herbaria of Kew, the British Museum, Paris, Berlin, Vienna, St. Petersburg, Holland, Edinburgh, New York, the Philippine Islands, Fribourg, and Le Mans, which have all been liberally placed in my hands for study. I may add that, with the exception perhaps of the Malayan Peninsula, each of the included areas may, in my opinion, be expected to contain perhaps twice as many species as have hitherto been collected in it. The number known to me in each is approximately as follows :—

China, 180 ; Indo-China, 18 ; Burma, including Assam, 70 ; the Malayan Peninsula, 12 ; the Malayan Archipelago, 50.

The following are the characters selected for the differentiation of the areas :—

1. INFLORESCENCE—pedicellate, when consisting of simple axillary pedicels, ebracteate or bracteate at the very base only ; in contrast with peduncled—the peduncles bearing one or more flowers with bracteate pedicels.
2. The absence of a BRACT at the base of the lowest pedicel of a two- or more-flowered peduncle (*I. nolitangere* is a species in which the lowest pedicel is ebracteate).
3. FLOWERS—the lateral sepals being four in number.
4. The distal lobes of the two WINGS being coherent or connate.
5. The ANTHERS being acute or acuminate.
6. FOLIAGE—the leaves being opposite or whorled (not alternate).

Other very important characters would be afforded by the staminal column, a comparatively minute structure, so contracted and deformed in herbarium specimens as to be in most species very difficult of analysis. The raphides, which abound in the leaves and often in the flowers of most species, are no doubt available for description, but many months of anatomical research would be necessary to utilize them for systematic work. So, too, with the nervation of the floral envelopes : this could be rendered available only by photographic representation through transmitted light. The anatomy of the leaves offers a rich field for research : it presents many various phases.

I have not included in the differentiation the remarkable character peculiar to a well-marked section of upwards of 20 Western Chinese balsams, which consists in the basal and often also the distal lobes of the wings being terminated by a very long flexuous filament of extreme tenuity, so fragile as to have been overlooked in descriptions of species belonging to the group.

		Total species in area.
i. Flowers simply pedicelled—		
Indo-China	16 ...	18
Malayan Peninsula	7 ...	12
China proper	14 ...	180
Burma	23 ...	70
Malayan Archipelago	30 ...	50
ii. Lowest pedicel ebracteate—		
Indo-China	0 ...	18
Malayan Peninsula	0 ...	12
China proper	34 ...	180
Burma	0 ...	70
Malayan Archipelago	0 ...	50
iii. Lateral sepals 4—		
Indo-China	3 ...	18
Malayan Peninsula	1 ...	12
China proper	25 ...	180
Burma	7 ...	70
Malayan Archipelago	0 ...	50
iv. Connate distal lobes of wings—		
Indo-China	7 ...	18
Malayan Peninsula	4 ...	12
China proper	1 ...	180
Burma	3 ...	70
Malayan Archipelago	1 ...	50
v. Anthers acute—		
Indo-China	0 ...	18
Malayan Peninsula	0 ...	12
China proper	40 ...	180
Burma	1 ...	70
Malayan Archipelago	1 ...	50
vi. Leaves opposite and whorled—		
Indo-China	1 ...	18
Malayan Peninsula	4 ...	12
China proper	40 ...	180
Burma	1 ...	70
Malayan Archipelago	1 ...	50

This table appears to indicate—

1. That the *Balsamineae* of Indo-China and the Malayan Peninsula conform, as regards the great preponderance of species with a simply pedicellate inflorescence ; this is also the case in Burma and the Malayan Archipelago.
2. An absence of species having no bract at the base of the lowest pedicel of a peduncled inflorescence ; this is also the case in Burma and the Malayan Archipelago.
3. The presence of species with four lateral sepals ; as is the case in Burma and China, but not in the Malayan Archipelago.
4. The presence of a considerable number of species with coherent or connate distal lobes of the wings ; as in three of Burma and one each of China and the Malayan Archipelago.

5. An absence of species with acute anthers, as in Burma and the Malayan Archipelago, in each of which only one has been collected out of 70 and 50 species respectively; in China proper, on the other hand, nearly one-fourth of the known species have acute anthers.

6. The solitary species with opposite or whorled leaves in Indo-China conforms to the condition of the genus in Burma and the Malayan Archipelago, in each of which areas only one of a large number of species shows this character; on the other hand, of the twelve Malayan Peninsular species four have opposite or whorled leaves, conforming with the Chinese area where species with this character are as numerous as those with acute anthers.

To conclude, the species of the Malayan Peninsula conform with those of Indo-China in all but one character, the sixth, and partly with that, and may be regarded as together indicating one and the same area, most nearly allied to the Burmese and very different from the Chinese.

How far these conclusions will prove aught but crude indications remains to be seen when fuller materials for their scrutiny shall be forthcoming.

Clavis Specierum.

A. Inflorescentia simpliciter pedicellata (pedunculo communi 0); pedicelli ebracteati v. ima basi tantum bracteati :—
  Folia opposita v. verticillata :—
    Folia et sepala linearia :—
      Folia basi rotundata v. cordata 1. *I. chinensis*, L.
      Folia basi longe angustata
        2. *I. Griffithii*, Hk. f. & Thoms.
    Folia et sepala ovata :—
      Folia membranacea, vexillum obcordatum
        3. *I. Curtisii*, Hk. f.
      Folia firma, vexillum orbiculare
        4. *I. Wrayi*, Hk. f.
  Folia alterna ; sepala saepissime 2 :—
    Alarum lobi distales liberi :—
      Calcar elongatum :—
        Alarum lobi dissimiles, sepala minima
          5. *I. Balsamina*, L.
        Alarum lobi consimiles apice obcordati :—
          Alarum lobi sinu terminale mutici :—
            Sepala 1-2 mm. longa 6. *I. Aureliana*, Hk. f.
            Sepala 5 mm. longa 7. *I. diffusa*, Hk. f.
          Alarum lobi sinu terminale aristati :—
            Folia crenulata, sepala 3–4 mm. longa
              8. *I. semounensis*, Hk. f.
            Folia serrata, sepala 7 mm. longa
              9. *I. attopeuensis*, Hk. f.

Calcar limbo labelli vix longius ; folia serrulata, sepala minuta ... 10. *I. indo-chinensis*, Hk. f.

Alarum lobi distales cohaerentes v. connati :—

Sepala ad medium v. altius connata :—

Folia lanceolata subserrulata, labelli limbus cymbiformis ... ... 11. *I. Harmandi*, Hk. f.

Folia ovata integerrima, labelli limbus hemisphericus ... ... 12. *I. zygosepala*, Hk. f.

Sepala libera :—

Caulis simplex plus minusve columnaris et cicatricatus :—

Folia ovata, crenata, utrinque 3–5-nervia ; sepala 10–12 mm. longa, labelli calcar brevissimum inflatum ... ... 13. *I. Boni*, Hk. f.

Folia ovata, crenata, utrinque 8–12-nervia ; sepala 12–14 mm. longa, labelli calcar modice elongatum ... ... 14 *I. Musyana*, Hk. f

Folia orbicularia, subcrenata, utrinque 4–5-nervia ; sepala 6–9 mm. longa, labelli calcar brevissimum inflatum ... 15. *I. pygmaea*, Hk. f.

Folia ovata, serrulata, utrinque 5–6-nervia, basi biglandulosa ; sepala 10–12 mm. longa, labelli calcar brevissimum 2-lobum 16. *I. verrucifer*, Hk. f.

Caulis ramosus :—

Folia utrinque 4–5-nervia :—

Folia late ovata, membranacea, crenulata ; sepala 6–7 mm. longa, labelli calcar breve incurvum... ... 17. *I. Ridleyi*, Hk. f.

Folia ovato-lanceolata, nervis obscuris ; sepala 7 mm. longa, cuspidata, labelli calcar breve incurvum... ... 18. *I. cryptoneura*, Hk. f.

Folia utrinque 8–13-nervia :—

Folia lanceolata, membranacea, serrulata ; sepala orbicularia, 10 mm. diam., labelli calcar brevissimum bifidum 19. *I. Lanessani*, Hk. f.

Folia lanceolata, crassiuscula, subserrulata ; sepala ovata, 10 mm. longa, labelli calcar limbum aequans incurvum bifidum 20. *I. Spireana*, Hk. f.

Folia ovato-lanceolata, membranacea, subcrenata ; sepala 10 mm. diam., labelli calcar 2-lobum lobis limbo scaphiforme semi-immersis ... ... 21. *I. macrosepala*, Hk. f.

B. Inflorescentia pedunculata ; pedunculi 2–∞ flori :—

Sepala 2 :—

Perennis, caulis obesus, folia decidua 10–20 cm. longa, alarum lobi distales leviter cohaerentes 22. *I. mirabilis*, Hk. f.

Herba ramosa, folia 2–5 cm. longa, utrinque 3–6-nervia, pedunculi 2–4 flori, sepala ovata 3 mm. longa 23. *I. Capusii*, Hk. f.

Herba caule simplice, folia 10–12 cm. longa, utrinque 8–10-nervia, pedunculi 3–5-flori, sepala oblonga 9 mm. longa 24. *I. oncidioides*, Ridley MSS.

Sepala 4 :—

Folia 12–16 cm. longa, nervis utrinque 8–14, pedunculi pauciflori ... ... 25. *I. Scortechinii*, Hk. f.

Folia 10–15 cm. longa, nervis utrinque 5–6, pedunculi multiflori ... ... 26. *I. claviger*, Hk. f.

Folia 10–16 cm. longa, nervis utrinque 9–12, pedunculi multiflori ... ... 27. *I. Balansae*, Hk. f.

Specierum Habitationes, &c.*

1. **I. chinensis**, *Linn. Sp. Pl.* 937.

Indo-China ; Tonkin, *Sergent Moulet* in Herb. Mus. Paris.

2. I. **Griffithii**, *Hk. f. et Thoms* in *Journ. Linn. Soc. Bot.* iv. 320.

Peninsula Malayana ; Johor, Mont. Ophir, rupibus graniticis, alt. 1520 m., *Griffith*, *Cuming*, *Ridley* in Herb. Kew.

3. I. **Curtisii**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 55.

Herba annua, glabra, ramulis gracilibus foliisque novellis supra hirtellis. *Folia* 6–10 cm. longa, opposita et alterna, suprema saepe 3–5-natim verticillata, petiolata, membranacea, ovata, acuta v. acuminata, minute denticulata v. crenulata setis minutis interjectis, supra laete viridia, subtus glaucescentia, basi cuneata interdum setis glanduliferis ciliata, petiolo 3–7 cm. longo gracillimo, nervis utrinque 10–12 ; glandulae infra-petiolares 0. *Pedicelli* solitarii, 3–5 cm. longi, gracillimi, ebracteati, fructiferi elongati. *Flores* 2–2·5 cm. expansi, pallide rosei. *Sepala* 2, 3–4 mm. longa, ovata v. ovato-lanceolata, acuminata, 3-nervia. *Vexillum* amplum, cuneatim obcordatum, costa gracile sinu mucronata. *Alae* ad 10 mm. longae, sessiles, profunde bilobae ; lobus basalis late obovatus, apice truncatus retusus, sinu mucronatus ; auricula dorsalis obscura. *Labelli* limbus scaphiformis, late ovatus, 2·5–3 mm. longus, acuminatus : calcar gracillimum, pendulum, 2–2·5 cm. longum. *Filamenta* brevissima, late linearia ; antherae late didymae, obtusae. *Ovarium* ovoideum, rectum, acutum. *Capsulae* ad 1·5 cm. longae, gibbosae, fusiformes v. ellipsoideae, utrinque attenuatae, obtusae, polyspermae. *Semina* immatura 2 mm. longa, obovoidea, compressa, minute papillosa, pallide brunnea.

Peninsula Malayana ; Perak, Mont. Thaiping, rupibus graniticis, alt. 900–1250 m., *Curtis*, *Scortechini*, *Ridley* ; Larut, *Hort. Bot. Calc. mercenarii* in Herb. Kew.

4. I. **Wrayi**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 55.

Herba annua, glabra v. ramulis foliisque novellis hirtellis ; caule 30 cm. alto gracile ramoso. *Folia* 5–8 cm. longa, opposita v. superiora ternatim verticillata, petiolata, crassiuscula, ovata v. oblongo-lanceolata, acuminata, integerrima v. spinuloso-serrulata, subtus glauca, basi in petiolum 2–2·5 cm. longum angustata, costa subtus crassa, pilosa, nervis utrinque 8–10 ; glandulae infra-petiolares et-sitpulares 0. *Pedicelli* 3–5 cm. longi, solitarii, ebracteati, fructiferi elongati. *Flores* ad 2·5 cm. expansi, rosei, disco coccinei. *Sepala* 2·5 mm. longa, late ovata, longe cuspidata, crassiuscula, 3–5-nervia. *Vexillum* orbiculare v. oblate obovatum, costa dorso medio rostrata apice cuspidata. *Alae* ad 2 cm. longae, sessiles, 2-lobae ; lobus

* In the following pages only such species are described in detail as have not been so treated previously. Two of the 12 Malayan Peninsula species (p. 3), having been made known only after this article was in type, shall be described in a future issue.

basalis oblongus, decurvus, obtusus; distalis ter longior, obcordatus; auricula dorsalis obtusa. *Labelli* limbus scaphiformis, 1·5 cm. longus, ore aristulato; calcar 3 cm. longum, gracillimum, rectum. *Filamenta* brevissima, linearia; antherae connatae, obtusae. *Capsulae* 2 cm. longae, ellipsoidae, utrinque breviter attenuatae, apice obtusae, polyspermae. *Semina* 3–4 mm. longa, ovoidea, compressa, pilis articulatis operta.

Peninsula Malayana; Perak, Batang Padang, rupibus calcareis, alt. 600 m., *L. Wray* in Herb. Kew.

The specimens are in poor condition: Mr. Wray notes that the flowers are pink with a crimson centre.

5. **I. Balsamina**, *Linn. Sp. Pl.* 938 forma hortensis.

Indo-China; Laos, *M. Maffie* in Herb. Mus. Paris.

The indigenous state of this plant, which is frequent throughout the warmer parts of India under various forms, has very recently been found in Sumatra.

6. **I. Aureliana**, *Hk. f.* in *Hook. Ic. Pl.* t. 2851.

Indo-China; *Pr. Henri d'Orleans* in Herb. Mus. Paris.

This dwarf species was collected in the Prince's adventurous journey from Indo-China to Burma, but in what locality is not recorded.

7. **I. diffusa**, *Hk. f.*, sp. nov.

Herba 2–3 cm. alta, glaberrima, flaccida, parviflora, caule succulento basi diffuse ramoso, ramis ramulisque gracilibus. *Folia* 0·5–12 cm. longa, alterna, petiolata, carnosula ?, exsiccata membranacea, ovata v. oblonga, acuta v. acuminata, indistincte crenata setulis interjectis, basi cuneata marginibus nudis v. ciliatis, in petiolum 2–3 cm. longum gracilem angustata, nervis utrinque 5–7 gracillimis. *Pedicelli* ebracteati, florentes folio breviores, fructiferi elongati. *Flores* ad 1 cm. expansi; raphides 0. *Sepala* 2, ovata v. ovato-rotundata, 5 mm. lata, mucronata, nervis laxe reticulatis. *Vexillum* trigonum, angulis rotundatis, 6–8 mm. latum, costa dorso alata apice mucronata. *Alae* sessiles, 8 mm. longae, alte bilobae, lobis erectis obcordatis sinubus muticis; auricula dorsalis parva, basin versus alae. *Labelli* limbus scaphiformis, ovatus, 7 mm. longus, in calcar gracile rectum 2 cm. longum attenuatus, ore ascendente apice rotundato mucronato. *Filamenta* brevia; antherae minutae, didymae, obtusae. *Ovarium* oblongum, obtusum. *Capsulae* fusiformes, 10–15 mm. longae, rectae v. gibbosim falcatae, medio tumidae, obtusae, polyspermae. *Semina* oblonga, 3 mm. longa, laevia, pallide castanea.

Indo-China; Sing Fung, *Dr. Harmand*, 89, in Herb. Mus. Paris.

I do not find the locality given for this species in any available atlas.

8. **I. semounensis**, *Hk. f.* in *Hook. Ic. Pl.* t. 2852.

Indo-China; sinu Semoun, muris templi ripis flum. Seng-treng, *Dr. Harmand*, 89 in Herb. Mus. Paris.

9. **I. attopeuensis**, *Hk. f.* in *Hook. Ic. Pl.* t. 2853.

Indo-China; Laos, sinu Attopeu, montibus 600 m. altis, *Dr. Harmand* in Herb. Mus. Paris.

10. **I. indo-chinensis**, *Hk. f.* in *Hook. Ic. Pl.* t. 2854.

INDO-CHINA ; Otacamund (Cambodia ?) alt. 1830–2130 m., *Pierre* in Herb. Mus. Paris.

11. **I. Harmandi**, *Hk. f.* in *Hook. Ic. Pl.* t. 2858.

INDO-CHINA ; *Spire* in Voyage de *Dr. Harmand*, 346 in Herb. Mus. Paris.

12. **I. zygosepala**, *Hk. f.* in *Hook. Ic. Pl.* t. 2857.

INDO-CHINA ; Cambodia, Kampoh, rupibus calcareis, *Geoffray* in Herb. Mus. Paris.

13. **I. Boni**, *Hk. f.* in *Hook. Ic. Pl.* t. 2860.

INDO-CHINA ; Tonkin, Thongsan et Kienkhe, *Bon*, 286, et Dick Long, monte Soi, *Bon*, 2879 in Herb. Mus. Paris ; Dong Harn inter rupis, *Bon*, 2086 in Herb. Mus. Fribourg.

14. **I. Musyana**, *Hk. f.*, sp. nov.

Herba humilis, succulenta, glaberrima, caule 5–6 cm. longo simplice robusto cicatricato inferne nudo. *Folia* 5–10 cm. longa, alterna, petiolata, crassiuscula, ovata, acuta v. obtusa, crenato-serrata, basi acuta, petiolo 1–4 cm. longo raro apice biglanduloso, nervis utrinque 8–12. *Inflorescentia* simpliciter pedicellata ; pedicelli solitarii, 3–4 cm. longi, basi ebracteati. *Flores* 3–5 cm. expansi, roseo-violacei, intus flavi. *Sepala* 4 ; 2 exteriora ovata v. ovato-rotundata, cuspidata, 12–14 mm. longa, firma, opaca, multinervia, nervis reticulatis ; 2 interiora minima, vix 1 mm. longa, oblonga, cuspidata, firma. *Vexillum* obovato-oblongum v. obcordatum, apice bilobum, 15–18 mm. longum, galeatum, recurvum, costa firma dorso infra medium alte carinata apice sinu rostellata. *Alae* amplae ; lobi basales 1·5–2·5 cm. longi, late falcatim obovati, incurvi ; distales in laminam amplam orbicularem 2–2·5 cm. diam. integram connatae ; auriculae dorsales parvae, arcte cohaerentes. *Labelli* limbus cupularis v. alte cymbiformis, ore oblongo acuto 2–2·5 cm. longo horizontale ; calcar breve, robustum v. subinflatum, 8–10 mm. longum, rectum v. incurvum. *Filamenta* linearia ; antherae in capitulum globosum inclinatum connatae. *Ovarium* leviter curvum, accuminatum.

INDO-CHINA : Tonkin, Mont. Soi, Deitslong, *Bon*, Herb. Miss. Tonquini occident., 2879 in Herb. Mus. Fribourg.

The flowers of the specimens of this species, kindly loaned by Prof. Musy, of Fribourg, at the request of the Director of Kew, are in a dilapidated state. They are remarkable for the great size of the wings, of which the distal lobes are connate, forming an orbicular lamina sometimes one and a quarter inch broad ; and adding to these the basal lobes which are produced upwards for one-third the length of the united distal, the whole breadth of the wings is nearly 2 inches. On the accompanying ticket indited "Herbarium Missionis Tonquini occidentalis" Father Bon adds "Planta carnosa, stricta ; flores roseo-violacei et flavi," and gives as the native name "Cay-cay-nin = Planta Candelabrum."

15. **I. pygmaea**, *Hk. f.*, sp. nov.

Herba humilis, glaberrima, carnosa, caule simplice 3–4 cm. alto crasso erecto inferne nudo cicatricato. *Folia* 2–4 cm. longa, alterna, longe petiolata, crassa, late ovata v. ovato-rotundata, petiolo 3–5 cm. longo, nervis utrinque 4–5. *Inflorescentia* simpliciter pedicellata ; pedicelli foliis breviores, basi ebracteati. *Flores* ad 2–5 cm. expansi, albi, apice violacei. *Sepala* 4 : 2 exteriora late ovata, acuminata,

6–9 mm. longa, tenuiter membranacea, 6–7-nervia; 2 interiora microscopica, ovata, membranacea. *Vexillum* oblongo-obovatum, 13 mm. longum, apice bilobum, costa dorso infra medium gibbo obtuso instructa apice sinu minute rostellata. *Alae* 2 cm. longae; lobi basales falcatim obovati, incurvi, basi acuti; distales in laminam suborbicularem 12–15 mm. latam ad medium bifidam connati, lobulis simplicibus v. sinu excisis; auriculae dorsales minutae. Labelli limbus late cymbiformis, obtusus, 14 mm. longus, ore horizontale; calcar brevissimum, inflatum, incurvum v. simplex v. bilobum. *Filamenta* brevia, linearia; antherae in capitulum incurvum connatae. *Ovarium* lineare.

Indo-China; Hao Nho, juxta rivulos umbrosos vallis Thongsan, *Bon*, Herb. Miss. Tonquini occident., 1399 in Herb. Mus. Fribourg.

As in *I. Musyana* the microscopic inner sepals all but escape observation; if present I have failed to find them in *I. Boni* to which *I. pygmaea* is most nearly allied, differing, however, greatly in the foliage, spur of the lip and size of all parts. Father Bon describes the leaves as "crassa" and flowers as above.

16. **I. verrucifer**, *Hk. f.* in *Hook. Ic. Pl.* t. 2856.

Indo-China; Tonkin, Tan Kaun, convalle de Lankok, (sylvis Mont. Bavi) *Balansa*, 3880 in Herb. Mus. Paris et Kew.

17. **I. Ridleyi**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 56.

Fruticulus glaber, 3–6 dm. altus; caule erecto v. ascendente lignoso inferne ramoso, ramis gracilibus foliosis. *Folia* 3–6 cm. longa, alterna, petiolata, membranacea, ovata, acuta v. acuminata, crenulata setulis passim interjectis, basi cuneata, saepe biglandulosa, petiolo 1·5–2·5 cm. longo gracillimo, costa gracile, nervis utrinque 4–5; glandulae infrapetiolares 0. *Pedicelli* solitarii v. bini, 2·5–4 cm. longi; capillares, ima basi bracteati. *Flores* ad 2 cm. expansi, albi, fusco maculati. *Sepala* 2, ovato-rotundata v. orbicularia, cuspidatim acuminata, 6–7 mm. longa, 5–7-nervia. *Vexillum* cuneatim obovatum, retusum, costa dorso incrassata, basi ala crassa brevi aucta, apice mucronata. *Alae* 2·5 cm. longae; lobi basales longe stipitati, ovato-oblongi, acuti, recurvi; distales duplo majores, oblongae, connatae; auricula dorsalis minuta. *Labellum* hemisphericum v. cupulare, ore obtuso mucronato; calcar limbo brevius, robustum, incurvum. *Filamenta* subelongata, linearia; antherae parvae, obtusae. *Ovarium* fusiforme, obtusum. *Capsulae* parvae, ellipsoideae, 8–10 mm. longae, substipitatae, apice rostratae, polyspermae. *Semina* minuta, 1·5–2 mm longa, obovoidea, compressa, minute granulata v. tuberculata, castanea.

Peninsula Malayana; Perak, speluncis calcareis Gua Batu, *C. Curtis*, *Ridley*, 8278 in Herb. Kew., *Dr. Franz Kehding*.

I am indebted to Mr. Ridley for a good drawing of this species, by Mr. Hussain.

18. **I. cryptoneura**, *Hk. f.*, sp. nov.

Fruticulus glaberrimus, ramosus, ramis teretibus lignosis. *Folia* 5–10 cm. longa, alterna, petiolata, crassiuscula, ovato-lanceolata, acuminata, subserrulata, basi acuta nuda v. biglandulosa, in petiolum gracilem 2–7 cm. longum angustata, nervis utrinque 4–5 gracillimis aegre distinguendis; glandulae stipulares 0. *Pedicelli* solitarii, foliis multo breviores, ebracteati. *Flores* subglobosi,

ad 2 cm. expansi. *Sepala* 2, ovato-rotundata, cuspidata, ad 7 mm. longa, viridia, nervis reticulatis. *Vexillum* obovatum, 8 mm. longum, recurvum, costa crassa dorso basi gibbo instructa, apice cuspidata. *Alae* 1·5 cm. longae, stipitatae, ope loborum distalium connatae; lobus basalis falcatim incurvus; distalis brevior oblongus; auricula dorsalis parva, inflexa. *Labellum* breviter saccatum, basi calcare brevi incurvo instructum, ore 10 mm. diam., apice acuto. *Filamenta* brevissima, subulata; antherae parvae. *Ovarium* breve, ovoideum, acutum.

Peninsula Malayana; Perak, prope Ipoh, rupibus calcareis, *C. Curtis*, 3172, in Herb. Kew.

The specimens which I have seen of this are in a very bad state, but I have been aided in the description by a drawing lent me by Mr. Curtis, late Superintendent of the Botanic Gardens, Penang, of a specimen which flowered in that garden in June, 1896. The leaves are of a remarkably soft texture, apparently not succulent, in which the very delicate nerves are with difficulty detected. This peculiarity, so obvious in dried specimens, is well seen in Mr. Curtis' drawing of the living plant.

19. I. Lanessani, *Hk. f.* in *Hook. Ic. Pl.* t. 2855.

Indo-China; Cochin-China inferior; Pulo Condor, *Lanessan* in Herb. Mus. Paris.

20. I. Spireana, *Hk. f.* in *Hook. Ic. Pl.* t. 2859.

Indo-China; Tonkin, regione Laos, *Spire*, 246 in Herb. Mus. Paris.

21. I. macrosepala, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 56.

Annua? fere glabra, caule erecto 6–7 dm. alto gracile basi simplice superne ramoso, ramis suberectis. *Folia* 5–10 cm. longa, alterna, longe petiolata, tenuiter membranacea, ovato-lanceolata, subcaudatim acuminata, obscure crenata setulis interjectis, juniora supra sparsim ciliolata, basi cuneata v. in petiolum gracillimum 2·5–4 cm. longum apice biglandulosum angustata, nervis utrinque 10–12. *Pedicelli* solitarii, filiformes, breves, basi nudi v. minute bracteati. *Flores* ad 2–5 cm. expansi. *Sepala* 2, orbicularia v. ovato-rotundata, ad 10 mm. diam., membranacea, labellum occludentia. *Vexillum* parvum, erectum, obovato-oblongum, costa dorso medio incrassata, apice mucronata. *Alae* ad 2 cm. longae; lobi basales stipitati, rotundati, stipite arcuato; distales ovato-oblongae, in laminam bifidam connatae. *Labelli* limbus parvus, scaphiformis, acutus, subtus mamillis 2 acutis parallelis auctus. *Filamenta* elongata, linearia; antherae didymae. *Ovarium* gracile, rectum, acuminatum. *Capsulae* fusiformes, 1·5–2 cm. longae, longe stipitatae et acute rostratae, oligospermae. *Semina* 3–4 mm. longa, minute granulata, fusco-atra.

Peninsula Malayana; Perak, rupibus calcareis prope Ipoh, *C. Curtis*, 3217. Siam Australis; Kasum, *Ridley in litt.* in Herb. Kew.

The above description is drawn up upon very imperfect materials. The large orbicular sepals, and didymous mamillae representing the spur of the lip distinguish it. No. 3217 represents elliptic-lanceolate leaves with petioles 10 cm. long.

22. I. mirabilis, *Hk. f.* in *Bot. Mag.* t. 7195.

Peninsula Malayana; Kedah, rupibus calcareis ins. Lankawi, *C. Curtis*, 1678; *W. Fox* in Herb. Kew.

23. I. Capusii, *Hk. f.* in *Hook. Ic. Pl.* t. 2864.

Indo-China; Sangir dak (? Songka ad ostia flum. Red river), *Capus* 2e Voy. in Herb. Mus. Paris.

24. I. oncidioides, *Ridley MSS.*

Herba fere glabra, caule simplice apicem versus folioso. *Folia* 10–12 cm. longa, alterna, submembrancea, petiolata, ovato- v. elliptico-lanceolata, acuminata, subserrulata, exsiccata subtus cuprea, basi in petiolum 2–3 cm. longum nudum v. pauciglandulosum angustata, nervis utrinque 8–10 gracillimis; glandulae stipulares 0. *Pedunculi* 6–10 cm. longi, 3–5-flori, pedicellique pubescentes v. glabrati; pedicelli 2–4 cm. longi, fructiferi elongati; bracteae 6–8 mm. longae, lineari-oblongae, acutae v. acuminatae, basin pedicellorum amplectentes, deciduae. *Alabastra* subglobosa, calcar limbo labelli brevius, incurvum. *Sepala* 2, oblonga, 9 mm. longa, mucronata, chartacea. *Filamenta* linearia, brevia; antherae connatae, obtusae. *Capsulae* 14 mm. longae, medio ellipsoideae, utrinque attenuatae, acute rostratae, polyspermae. *Semina* minuta, orbicularia, compressa, 2 mm. diam., atro-castanea, nitida.

Peninsula Malayana; Perak, Batang Padang, *L. Wray*, alt. 1,500 m., 1491 in Herb. Kew.

The specimens are in so imperfect a state that I long hesitated to describe and name them, but the species is so handsome and so well marked as the only peninsular one except *I. mirabilis* with peduncled inflorescence, that it cannot fail to be recognised. The leaves in a dried state are of a curious dull coppery-red colour beneath. Flowering specimens from Mr. Ridley have been received at Kew, but too late for description in this article.

25. I. Scortechinii, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 56.

Herba glaberrima, succulenta, 2–3 dm. alta, caule erecto simplice robusto longe nudo laeve v. cicatricato, nunc inferne 2–3 cm. diam. *Folia* apicem versus caulis conferta, 12–16 cm. longa, alterna, longe petiolata, ovato-oblonga v. subrotundata, acuminata, serrata v. serrulata, basi cuneata, petiolo 1–2 cm. longo gracile, costa subtus robusta, nervis utrinque 8–14; glandulae stipulares 0. *Pedicelli* solitarii v. plures, pedunculo abbreviato sessiles, petiolis breviores, graciles, floriferi elongati. *Flores* ampli, albi, intus rubri. *Sepala* 4, 2 exteriora 10 mm. longa, late oblonga v. orbicularia, obtusa v. cuspidata, membranacea, viridia; interiora parva, ovato-lanceolata, acuminata. *Vexillum* obovato-oblongum v. cuneiforme, 2 cm. longum, apice rotundatum v. truncatum, costa dorso infra medium incrassata, apiculata. *Alae* 2·5–3 cm. longae; lobi basales ampli, rotundati, stipitati, stipite arcuato; distales oblongi in laminam latam bifidam connati. *Labelli* limbus late infundibularis, ore cuspidato, inferne in calcar breve robustum incurvum apice bifidum attenuatus. *Filamenta* 4–5 mm. longa, linearia; antherae majusculae, oblongae. *Ovarium* gracile, falcatum, longe rostratum. *Capsulae* 2–5 cm. longae, medio cylindraceae, longe stipitatae et graciliter rostratae, subtorulosae, oligospermae. *Semina* oblonga v. obovato-oblonga, 5 mm. longa, laevia, pallide fusca.

Peninsula Malayana: Perak, Sungit Siput, rupibus calcareis *C. Curtis*, 3115; Kwala Dipang, *Scortechini*, 1582, 1883, *Kingii mercenarii*, 7057 in Herb. Kew.

26. I. claviger, *Hk. f.* in *Hook. Ic. Pl.* t. 2863.

Indo-China; Tonkin, sylvis Mont. Bavi, convalle Lankok, *Balansa*, 3881 in Herb. Mus. Paris et Kew.

27. I. Balansae, *Hk. f.* in *Hook. Ic. Pl.* t. 2862.

Indo-China; Tonkin, sylvis Mont. Bavi, convalle Lankok, *Balansa*, 3880 in Herb. Mus. Paris et Kew.

II.—AUSTRALIAN PASTURE HERBS.

The following article on the economic value of Australian pasture herbs as stock feed was contributed by Mr. Fred. Turner, F.L.S., to the *Sydney Morning Herald* and was published in the issue of July 11th, 1907. As the article is of more than local interest and value it is reprinted here by kind permission of the proprietors of the *Herald*.

The Economic Value of the Australian Pasture Herbs.

Observant persons who have travelled much on the Australian continent cannot have failed to notice the large number of herbs, other than grasses and saltbushes, growing over immense tracts of country, and forming a good percentage of the indigenous herbage on many sheep and cattle stations. Owing to their varied character —for there are representatives of many different families of plants— these nutritious fodder herbs are a most important factor in making Australian native pastures rich feeding grounds for all kinds of stock. Moreover, the succulent stems and leaves of many of these plants assuage the thirst of the animals that eat them. Many of these herbs have long, strong roots, which penetrate deeply into the earth, and enable the plants to withstand a long period of dry weather, without any appreciable check to their growth. When not too closely fed over, they produce an abundance of seed which germinates readily under ordinary conditions, therefore they are fairly plentiful in many parts of the country. Most of them are herbaceous plants, and many are of upright habit, growing about one foot high, while several have prostrate stems, which lengthen considerably in good seasons.

Darling Clover (*Trigonella suavissima*).—This plant is sometimes called "Menindie clover," and "sweet-scented clover," but to the aborigines of the Darling country it is known as "Calomba." This clover-like plant, with fragrant stems and foliage, occurs in more or less abundance over an immense area in the interior. In favourable situations it is of perennial duration, and produces succulent stems three feet long or more. When growing on rich black soils that are subject to periodical inundations it produces a large amount of nutritious herbage, of which stock are particularly fond, and on which they fatten. Though this plant gives the greater yield of herbage on fertile land, it often grows on stony rises and on inferior country, and in such situations it is a valuable addition to the

pastures, as it provides good feed in late winter and early spring ere many other useful forage herbs begin to put forth much new growth. Sir Thomas Mitchell, exploring in the interior, *inter alia*, wrote of this plant, which he called "Australian shamrock"; "The perfume of this herb, its freshness and flavour, induced me to try it as a vegetable, and we found it to be delicious, tender as spinach, and to preserve a very green colour, when boiled." This opinion has since been confirmed by other persons who have used it in a similar way. The perfume of this plant is due to the presence of the chemical principle coumarine, which pervades all parts of the plant. The Darling clover is one of the many indigenous herbs that would repay systematic cultivation in the interior, where exotic clovers would not succeed, owing to the aridity and great heat in summer. If cut when in flower, and properly cured, it makes good hay, and would probably pay to be grown for ensilage.

Crowfoot.—Two important herbs are called "crowfoot," viz., *Erodium cygnorum* and *Geranium dissectum*. The former is an annual or biennial plant, with stems usually lying flat upon the ground, and three feet or more long. It has large, deeply-lobed leaves and blue flowers, and when in bloom is a conspicuous object amongst the surrounding vegetation. In spring and early summer it often forms 60 per cent. of the herbage on some areas. This plant is widely distributed over the Australian continent, and grows as frequently on sandy as on more fertile country. It is a superior pasture herb, and whilst young affords rich, succulent herbage, of which herbivora of all descriptions are remarkably fond. Horses will often leave good feed to browse upon it. All stockowners speak very highly of this herb, and regard it in a young state as an excellent forage plant. Under cultivation it produces a large amount of herbage, and if cut when in flower not only makes valuable green food, but, when properly cured, capital hay. This "crowfoot" when in fruit is disliked by the sheep-owner, on account of its sharp-pointed seed lobes, which not only attach themselves firmly to the wool, but sometimes penetrate the skin of the animals.

The *Geranium* is a spreading perennial plant with a thick, carrot-like root, deeply-divided leaves, and usually pink flowers. It is fairly abundant in many parts of the interior, and withstands a long period of dry weather without its growth being seriously checked. In times of drought the roots remain dormant, but after a good fall of rain put forth stems and leaves in abundance. All kinds of stock are partial to this plant, which is considered nutritious. Sheep are very fond of the carrot-like roots, and often scrape away the soil with their hoofs in order to get at them. At one time the roots formed an important article of food for the aborigines, who used to roast them on ashes. The seed lobes of this plant have no sharp points like those of the one previously referred to.

Hogweed, or Pigweed (*Boerhaavia diffusa*).—This is a perennial plant with spreading stems growing sometimes several feet long, and often forming a dense mass of herbage. It occurs over large tracts of both good and inferior country in the interior, and in many places is fairly plentiful. Its rather thick, fleshy, long roots, which at one time formed an article of food for the aborigines, are said to

have vermifugal properties. This plant withstands a long period of dry weather, and its green leaves and small pink flowers may often be seen when the surrounding vegetation is dried up for want of rain. It is a good forage plant, and both sheep and cattle are very partial to it. As it begins to grow very early in the season, before many other useful kinds of herbage put forth new leaves, it is a desirable plant to encourage in the pastures. The "hogweed" frequently grows in juxtaposition to members of the mallow family, particularly species of the genera *Lavatera*, *Malvastrum*, and *Sida*, several of which whilst young are good forage plants. In that state sheep and cattle are very fond of them, for both their stems and leaves are succulent and mucilaginous.

Mustard.—Many cruciferous plants, notably species of the genera *Blennodia* and *Lepidium* are popularly known by the name of mustard, with varying prefixes, or cress, on account of the pungent flavour that pervades most of them. Towards the end of winter or early spring the bright flowers of a number of species are a conspicuous feature on many of the inland plains. Although the prevailing colour of the flowers is yellow, it varies in intensity, and there are several species which have white, purple, pink, or lilac blooms. Most of these herbs average about 1 foot in height, and are very good forage plants, which most kinds of stock eat with avidity, their more or less pungent flavour contributing to their palatability. Dairy cows giving milk, however, should not be allowed to graze in pastures where these plants grow abundantly, for when eaten freely they flavour both milk and butter, often to such an extent as to render them unfit for domestic use. All these plants, when not too closely fed over, produce an abundance of seed, which germinates readily after a good rainfall at almost any season of the year, and the resulting growth is a quantity of succulent herbage.

Nardoo (*Marsilea Drummondii*).—This is a plant of historical interest, inasmuch as its fruit at one time formed, after preparation, an important article of food for the aborigines, and is still used by them in the far interior, and the unfortunate explorers Burke and Wills tried to subsist on it, although, judging from Wills' journal, it does not appear to have afforded them much nourishment. This dwarf, clover-like plant, occurs in the interior of all the Australian States, generally on the margins of swamps or where water collects in shallow pools after rain. When the water subsides the young plants grow rapidly in the mud, and eventually cover the ground with dense vegetation, reminding one of cultivated clover. All kinds of stock are extremely fond of this plant, which is regarded as nutritious feed.

Native carrot (*Daucus brachiatus*).—An annual herb with herbaceous stems, often growing from 2 feet to 3 feet high, but generally not so tall, has elegant, divided leaves, small flowers arranged in clusters, and burr-like fruits, which are, when ripe, called "carrot burrs" by stockmen. This plant is widely distributed over the interior, growing on both rich and sandy country, and in spring and early summer forms a large percentage of the herbage on extensive areas. In a young state the "native carrot" is an exceedingly good forage plant, to which most kinds of pasture animals are partial,

particularly sheep, which thrive on it. This herb is closely allied to the cultivated carrot, and its leaves have a pronounced taste like those of that plant, and, therefore, cows giving milk should not be allowed to graze in pastures where it grows prolifically, or a "flavour" may be imparted to both milk and butter. The "native carrot" improves much under cultivation, and yields a larger bulk of herbage than is usually seen under the best natural conditions. This plant produces an abundance of seed, which germinates readily after rain, and to these circumstances may be attributed its extensive growth in the interior. Its seeds, "carrot burrs," covered with hooked bristles, are very much disliked by the sheep-owner, because they adhere to the fleece with great tenacity, and, therefore, are troublesome to get out of the wool. The allied genus *Apium* consists of two species, popularly called "native parsley," which are eaten and relished by stock.

Native lucerne (*Psoralea tenax*).—It is a perennial plant of the pea-flowering family, with slender branching stems, growing from 1 foot to 2 feet high or more, divided leaves and small, usually blue, flowers disposed on rather long stalks. It has long, very strong roots, which penetrate the earth for from 5 feet to 7 feet or more, and thus enable the plant to endure a phenomenal amount of dry weather without its growth being checked to any serious extent. The native lucerne grows over a great part of New South Wales and Queensland, and many pastoralists regard it as an excellent forage plant. Most herbivora are fond of its succulent stems and foliage, and seem to do well on them.

Several species of the allied genus *Swainsona*, which are widely distributed over the continent, are very good forage plants, stock eating them readily and thriving on them. Two species (*S. galegifolia* and *S. Greyana*), however, popularly known as cranky pea, Darling pea, and indigo, are suspected poison plants, but many conflicting statements have been made regarding them. When stock, particularly sheep, eat no other plants for a time, serious consequences frequently follow, but when they eat them with plenty of other herbs and grass ill-effects have rarely been noticed. There are other leguminous or pea-flowering herbs belonging to different genera, and occurring in many parts of Australia, that are very good forage plants, and are largely eaten by all herbivora.

Native plantain, or wild sago, (*Plantago varia*).—A perennial herb, with a long root, and leaves varying from less than 6 inches to 1 foot long. It is found over a great part of Australia, and on large areas in the interior it is fairly abundant. This plant grows on both rich and inferior country, but on the former yields a larger amount of herbage. Its succulent, mucilaginous leaves are much relished by sheep and dairy cows fed on the plant are said to yield plenty of milk. Horses, however, eat the plant but sparingly. When not too closely fed over, this plant produces an abundance of seed upon which some kinds of birds feed. Its seeds are sometimes gathered by the settlers in the back country, who use them as a substitute for commercial sago, hence one of its common names. There are six species and several varieties of the genus *Plantago* indigenous to Australia, three of them occurring in the coldest parts, with much the same properties as the one referred to.

Parakeelya (*Calandrinia balonensis*).—Is the aboriginal name of a plant widely distributed in the drier and hotter parts of the continent. This is an erect-growing plant of from 6 inches to 1 foot high, or more ; the slender branching stems of which are clothed with thick, fleshy leaves 1 inch to 2 inches long. Its rather large purple flowers are disposed on terminal stalks. When figuring and describing, under instructions from the Government of Western Australia, the plants of economic value that compose the pasture herbage of the western part of the continent, my attention was drawn to this plant with very succulent leaves as being one of the best to assuage the thirst of stock that eat it. It is now well known that Parakeelya affords both feed and moisture to herbivora in waterless country, and there are authentic records of stock having travelled nearly 300 miles without a drink of water over country where this plant was growing. Some allied species have similar properties. The Purslane, or Munyeroo, of the aborigines (*Portulaca oleracea*), is an annual, belonging to the same family as the Parakeelya, with succulent stems and leaves which are much relished by most pasture animals, and which in the interior often afford them both feed and moisture. This plant produces numerous, small, black seeds, which are collected and used as an article of food by the aborigines in the back country. Its stems and leaves are often cooked and eaten.

Warrigal cabbage (*Tetragonia expansa*).—This is both an excellent table vegetable, when properly cooked, and a very good forage plant. It is a prostrate-growing annual, with stems, which sometimes extend several feet, clothed with succulent leaves from 2 inches to 4 inches long. It is widely distributed, and common in many parts of the interior on both good and inferior country, and it withstands an extraordinary amount of dry weather. Sheep and cattle are particularly fond of its succulent stems and leaves, which not only provide good feed, but assuage the thirst of the animals that eat them—a great consideration in dry seasons in the interior. Other members of the same family have similar characteristics.

The above brief descriptions of some of the most prominent pasture herbs indigenous to Australia will give a good idea of the great importance of these plants in the pastures, and the necessity of systematically conserving them in order to keep the grazing areas in a suitable condition for feeding stock.

FRED. TURNER.

III.—PLANT DISEASES.—IX. DRY SCAB OF POTATOES.

(*Spondylocladium atrovirens*, Harz.)

G. MASSEE.

This disease is caused by a parasitic fungus named *Spondylocladium atrovirens*, Harz. It has been known on the Continent since 1871, and under the name of *Phellomyces sclerotiophorus*, Frank, is stated by Professor Johnson to be the cause of serious trouble to the potato crop in Ireland. It also occurs in the United States.

Within the past few weeks three samples of diseased potatoes were submitted to Kew for examination. Two of these came from different parts of Scotland, the other from England. The disease in each instance proved to be "Dry Scab," which up to the present was believed to be absent from Britain.

The injury is confined to the tubers, and no indication of its presence is suggested by the foliage, which remains unaffected. It causes disfigurement of the surface of the tuber, followed by local patches of a dry rot. It presence is revealed by the occurrence of blackish-olive or blackish-violet patches, which soon become depressed below the general surface of the tuber, due to the drying and breaking up of the tissue. Very frequently only one or two such sunken areas, which vary from half an inch to an inch across, are present on a tuber. As a rule, numerous very minute black sclerotia are present in the epidermal cells, or on the surface of the tuber, in the region of the sunken areas. In some instances numerous minute sclerotia, scattered over the surface of the tuber, are alone present. During a certain period in the development of the disease, the depressed patches and the sclerotia are covered with the fruit of the fungus, which under a pocket-lens resembles myriads of very minute, upright black bristles. As the dark coloured mycelium permeates the tuber, the tissue becomes dry and somewhat powdery, and crumbles away leaving a shallow cavity. Those portions of the skin bearing sclerotia also readily peel off in flakes, which remain in the soil and endanger future crops. If a tuber bearing sclerotia or sunken areas is placed in a damp, warm place, the fruit of the fungus is produced in abundance within a few days. Such fruit is not confined to the obviously diseased portions, but occurs scattered over the entire surface of the tuber, proving that mycelium migrates from the primary diseased areas, and that portions of the tuber apparently free from disease are in reality infected; consequently it is not advisable to use as "sets" any tubers showing signs of the disease, as is too frequently done, after the obviously diseased portion has been cut away.

The sclerotia and mycelium, in the absence of fruit, were described by Frank under the name *Phellomyces sclerotiophorus*.

1. Tuber showing diseased depressed areas and minute sclerotia.
2. *Spondylocladium atrovirens* × 300.
3. A sclerotium on the surface of a tuber × 50.

At a later date Appel and Laubert succeeded in obtaining the fruit of *Spondylocladium atrovirens*, Harz, from these sclerotia, and consequently *Phellomyces* disappears as a genus. This proof has been verified at Kew.

Failure has attended attempts to infect roots of carrot, parsnip, and turnips with *Spondylocladium*, and it is just possible that this parasite may be confined to potatoes.

The habit of the fungus is shown in the accompanying illustration. The conidiophores are coloured, 300–400 μ high. Conidia 30–50 × 6–9 μ.

The following extract from a letter received from an Agricultural College, along with one of the diseased lots of potatoes, proves that the disease is not quite new to this country, and also proves that tubers known to be diseased are sometimes planted :—

"They were grown on moss land . . . which had been uncropped for five years, and was manured with leaf mould and basic slag. The 'seed' potatoes were similarly affected."

Bibliography.

Appel and Laubert ; Ber. deutsch. Bot. Ges., 23, p. 218 (1905).
Clinton ; State Conn. Exp. Sta. Rep., 1907–08.
Frank ; Ber. deutsch. Bot. Ges., 16, p. 280 (1898).
Harz ; Einige Neue Hyphomyceten, p. 129, pl. 31 (1871).
Johnson ; Econom. Proc. Roy. Soc. Dublin, 1, p. 161 (1903).

IV.—THE SECTION OMPHACARPUS OF GREWIA IN AFRICA.

T. A. Sprague.

The genus *Omphacarpus* was founded by Korthals about 1839–1842 (Verh. Nat. Gesch. Bot. p. 192, t. 42) to receive two tiliaceous shrubs, both of them natives of Borneo. Though establishing it as a distinct genus on account of the nature of the fruit—a 1-celled 1-seeded drupe with fibrous mesocarp and coriaceous endocarp—Korthals clearly recognised its close relationship with *Grewia* ; indeed, he admitted that it might be regarded as a section of that genus taken in a wide sense, and might then be placed alongside the section *Microcos*. His two species were *Omphacarpus opacus*, with undivided stipules and glabrous fruits, and *O. hirsutus*, distinguished by tripartite stipules and hirsute fruits.

In 1849 Hooker fil. (Niger Fl. p. 237) added a third species, *O. africanus*, from Sierra Leone. Ten years later Miquel (Fl. Ned. Ind., i. part 2, p. 204) reduced *Omphacarpus* to the status of a section of *Grewia*, and as such it has been regarded by subsequent authors.

Masters in 1868 (Fl. Trop. Afr., i. p. 243) added two new African species to the section, and described a third, *G. coriacea*, which he supposed to be exinvolucrate, and therefore excluded from

it. It is now known, however, to possess the involucre and fruit characteristic of the section. Six years later he described (Fl. Brit. Ind., i., p. 391) four new species from the Malay Peninsula, and a fifth, previously published by Kurz, from the Andamans.

Finally, King, in 1891 (Materials, vol. i. p. 218), referred *G. Miqueliana*, Kurz, to the section, and described an additional species, from Perak. The excellent key and descriptions given by King make it quite evident that the separation of *Omphacarpus* as a genus, or even as a subgenus, cannot be upheld, as two or three pyrenes are found in some of the species, and the pyrenes may vary from 1-celled to 3-celled (*G. laurifolia*).

Turning now to the African species described since 1891 :—*G. barombiensis*, K. Schum., published in 1892, as belonging to section *Microcos* ; *G. calymmatosepala*, K. Schum., described in 1903, as an ally of *barombiensis* ; and *G. ugandensis*, Sprague, published in 1906, appear to be valid. The remaining five species, however, have had to be reduced.

Details of the number of cells in the ovary, and of the ovules in each cell are not available for most of the Asiatic species. In the African species, however, I have invariably found the ovary to be 3-celled, except in *G. pinnatifida*, where it is 2-celled ; and the ovules are 4 in each cell, except in *G. coriacea*, which has 2 per cell.

A short diagnosis of the section, applicable, however, only to the African species, may be found useful :—*Cymae* paniculatae cymulis involucratis. *Ovarium* 3-loculare, rarius 2-loculare ; ovula 4 pro loculo, rarius 2. *Drupa* pyriformis, 1-locularis, monosperma, mesocarpio fibroso.

Clavis specierum.

Stipulae integrae vel laciniatae ; inflorescentiae et nervi foliorum subtus pilis simplicibus non hirsuti.
- Folia utrinque glabra, maxima (14–27 cm longa) ; ovarii loculi 2-ovulati ... ... 1. *coriacea.*
- Folia subtus ± induta, minora ; ovarii loculi 4-ovulati.
  - Folia subtus pilis stellatis inspersis puberula.
    - Stipulae laciniatae (species occidentales).
      - Folia exsiccando utrinque brunnea ; inflorescentiae brunneae, elongatae, multiflorae ramis ascendentibus ... ... 2. *africana.*
      - Folia exsiccando subtus vel utrinque viridia ; inflorescentiae fulvae, graciliores, laxiusculae ramis patentibus vel patulis ... 3. *barombiensis.*
    - Stipulae integrae (species orientalis) 4. *calymmatosepala.*
  - Folia subtus indumento minuto continuo.
    - Folia subtus griseo-vel albido-tomentella, opaca.
      - Bracteae pedicellis breviores... 5. *malacocarpa.*
      - Bracteae pedicellis multo longiores, alabastra subaequantes ... ... 6. *Drummondiana.*
    - Folia subtus pallide isabellina, indumento subtili sub lente argenteo-nitidulo pilis majoribus brunneis inspersis ... ... 7. *ugandensis.*

Stipulae pinnatifidae; inflorescentiae et nervi foliorum subtus pilis simplicibus hirsuti.

Folia exsiccando pallide brunnea vel viridia; nervi laterales utrinque 11–15; stipulae non furfuraceae; ovarium 2-loculare ... ... 8. *pinnatifida.*

Folia exsiccando intense brunnea; nervi laterales utrinque 6–8; stipulae furfuraceae; ovarium 3-loculare 9. *oligoneura.*

1. **Grewia coriacea**, Mast. in Fl. Trop. Afr., i. 1868, p. 252; De Wild. in Ann. Mus. Congo, sér. 5, ii. 1908, p. 298.

Masters described this species as having exinvolucrate cymules and a 2–3–∞-celled ovary with numerous ovules attached in a double row to the inner angle of each cell. The cymules, however, are involucrate, as in the other species of the section, and the ovary appears to be constantly 3-celled with 2 ovules only in each cell. The cells, which are comparatively small, are situated in the lower half of the fleshy ovary, and have very thin septa, whilst the outer wall of the ovary is relatively very thick; consequently, the dissection of the ovary is unusually difficult.

The fruits have not hitherto been described. They are brown or buff coloured in the dried state, 2·5–3 cm. long, and glabrous.

Cameroons. Efulen, *Bates*, 400! Bipinde, *Zenker*, 1554! 2616! 2623! 2625! 3009! 3197! 3329! 3454! Spanish Gaboon. Kongui River, *Mann*, 1695! Congo Free State. Eala, *Marc Laurent*, 1192; Injolo, *Marc Laurent*, 1850, 1857, 2050; Impolo, *Huyghe & Ledoux*, 37; Madibi, *A. Sapin.*

Native names in the Congo Free State:—Bofumbo (Bangala), Binganganan (Kwilu).

2. **G. africana**, Mast. in Fl. Trop. Afr., i. 1868, p. 253.

Omphacarpus africanus, Hook. f. in Niger Fl. p. 237 (1849).

Grewia brunnea, K. Schum. in Engl. Jahrb., xxxiii. 1903, p. 301.

Sierra Leone. *Don*! Cameroons. Yaunde Station, *Zenker*, 603! 672. (671! in herb. Kew).

Don's specimen is in fruit, whilst Zenker's are in flower, but the foliage and inflorescence match so exactly that I have no hesitation in reducing *G. brunnea.*

Christian Smith's Congo specimen, quoted by Masters under *G. africana*, is certainly distinct, and probably represents an undescribed species. The indumentum of the lower surface of the leaves is very different.

3. **G. barombiensis**, K. Schum. in Engl. Jahrb., xv. 1892, p. 124; De Wild. in Ann. Mus. Congo, sér. 5, ii. 1908, p. 298.

G. Laurentii, De Wild. Miss. Emile Laurent, p. 399, t. 125 (1907), e descr. et icone.

The excellent figure and description of *G. Laurentii* leave no doubt as to its being identical with *G. barombiensis.*

Schumann has described the ovary of *G. barombiensis* as 2-celled; I have found it to be 3-celled, however, in each of five flowers examined, two of which were from the type number.

Lagos. Forest clearings at Ajilite, *Millen*, 171! Cameroons. Barombi Station, *Preuss*, 385! Bipinde, *Zenker*, 1039! 1937b! 2400! 3678! Lower Congo. *Gillet.*

4. **G. calymmatosepala**, K. Schum. in Engl. Jahrb., xxxiii. 1903. p. 302.

German East Africa. Usambara, near N'derema, 800 m., *Scheffler*, 90.

5. **G. malacocarpa**, Mast. in Fl. Trop. Afr., i. 1868, p. 253 ; Stapf in Johnston, Liberia, ii. p. 583.

G. dependens, K. Schum. in Engl. Jahrb., xxxiii. 1903, p. 304.

G. malacocarpoides, De Wild. in Ann. Mus. Congo, sér. 5, vol. ii. 1908, p. 298, e descr.

The type specimen of *G. malacocarpa* bore fruit but no flowers, and this no doubt led to Schumann's describing flowering material from Togoland as a new species. Schumann stated that the close grey indumentum on the lower surface of the leaves distinguished *G. dependens* from all the other species with paniculate inflorescence, but this indumentum is characteristic of *G. malacocarpa*.

The differences adduced by De Wildeman as distinguishing *G. malacocarpoides* from *G. malacocarpa* lie in the colour of the indumentum, the shape and nervation of the leaves, and the absence of glabrous acarodomatia in *G. malacocarpoides*. The series of specimens in the Kew Herbarium exhibits similar differences in the leaves, but after dissecting side by side flowers of Liberian, Togoland, Lagos and Cameroons specimens I am unable to detect any differences in them which would, in my opinion, justify segregation. The glabrous acarodomatia are only evident on the leaves of Bate's No. 441, but they are present on the other specimens, masked, however, by the tufts of hairs so frequently found on the lower surface of leaves in the axils of the lateral nerves. The indumentum thus appears continuous, as described for *G. malacocarpoides*. The pedicels of *G. malacocarpoides*, however, are from description only 3 mm. long, as against 4–6 mm. in *G. malacocarpa* ; and seem to be little longer, therefore, than the bracts.

Liberia. Near Kakatown, *Whyte !* Sino basin, *Whyte !* Togoland. On the Day River at Cwegbe, *Baumann*, 441 ! Western Lagos. In the interior, *Rowland !* Northern Nigeria. Confluence of the Niger and Benue Rivers, *Barter*, 447 ! Cameroons. Efulen, *Bates*, 414 ! Congo Free State. Eala, *L. Pynaert*, 590 ; Bomaneh, *Marc Laurent*, 1861, 1864.

6. **G. Drummondiana**, *Sprague*, sp. nov.

Frutex scandens. *Folia* ovata vel ovato-oblonga, apice acutiuscule acuminata, basi rotundata, 7–12 cm. longa, 3–5·5 cm. lata, supra exsiccando viridia nervis stellato-puberulis ceterum glabrescentia, subtus sordide griseo-tomentella nervis et venulis prominentibus ; nervi laterales utrinque 4–5 ; petioli 8 mm. longi, tomentelli ; stipulae subulatae, circiter 3 mm. longae. *Cymae* brunneo-tomentellae, divaricatae. *Bracteae* 5–6 mm. longae, alabastra aequantes, profunde bipartitae vel tripartitae lobis linearibus vel subspathulatis. *Pedicelli* 2–3 mm. longi. *Ovarium* 3-loculare, loculis 4-ovulatis.

Gaboon. Como River, 75 miles from Gaboon, *Bates*, 459 !

In habit and foliage *G. Drummondiana* resembles *G. malacocarpa;* in the large bracts and coarse indumentum of the inflorescence it approaches *G. barombiensis*. Named in compliment to Mr. J. R. Drummond, who has freely afforded the writer the benefit of his extensive knowledge of the genus *Grewia*.

7. **G. ugandensis**, Sprague in Journ. Linn. Soc., xxxvii., 1906, p. 503.

Uganda. Unyoro, *Dawe*, 918!

8. **G. pinnatifida**, Mast. in Fl. Trop. Afr., i., 1868, p. 253; De Wild. Miss. E. Laurent, p. 399; Ann. Mus. Congo, sér. 5, ii., p. 299.

G. crinita, K. Schum. in Engl. Jahrb., xxxiii., 1903, p. 303.

Gaboon. Sierra del Crystal, *Mann*, 1738! Sibange Farm, *Soyaux*, 161! 221! Congo Free State. Near Bolombo, *Laurent*; Romée, *Marc Laurent*, 1059; Nala, *Seret*, 804; Yambuya, *J. Solheid*, 61.

I have not seen any specimens from the Congo Free State, but, judging from the geographical position, the determinations are presumably correct.

9. **G. oligoneura**, *Sprague*, sp. nov.

Arbor 7·5–9 m. alta. *Ramuli* primum hirsuti, demum glabrescentes. *Folia* oblanceolato-oblonga, apice longe acute acuminata, in basin obtuse et inaequaliter angustata, 11–19 cm. longa, 3·5–5·5 cm. lata, supra nervis puberulis vel hirsutis ceterum glabra, subtus nervis et venulis prominentibus puberulis nervo medio hirsuto; petioli 5–7 mm. longi, hirsuti, furfuracei; stipulae usque ad 1 cm. longae, hirsutulae, furfuraceae, laciniis utrinque 3–5 usque ad 6 mm. longis. *Inflorescentiae* juveniles 7–8 cm. longae, laxiusculae ramis ascendentibus.—*G. pinnatifida*, K. Schum. in Engl. Jahrb., xxxiii., 1903, p. 304, in obs., non Mast.

Cameroons. Yaunde Station, *Zenker*, 683! Fernando Po. *Mann*, 210!

Closely allied to *G. pinnatifida*, but easily distinguished by the characters given in the key, and also by the laxer inflorescence with ascending branches. Schumann, who had not seen the type of *G. pinnatifida*, took the present species for it, and described Gaboon specimens of the true *pinnatifida* as a new species *crinita*.

V.—MISCELLANEOUS NOTES.

Mr. Archibald Clarence Miles, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator of Botanic Stations in the Agricultural Department of the Gold Coast.

Mr. W. C. Worsdell has been appointed deputy Professor of Botany at the South African College, Cape Town, South Africa, in the room of Professor H. H. W. Pearson during his travels in Angola and elsewhere in the present year.

Retirement of Mr. W. B. Hemsley.—The official services of this well-known member of the Kew staff came to an end, on his reaching the age limit, on 28th December, 1908. Mr. William Botting Hemsley, who had as a boy evinced strong botanical tastes, entered Kew as a young gardener in 1860, when 16 years of age. After he had spent some time in that capacity his remarkable botanical aptitude led to his employment in the Herbarium, where

his work attracted the attention of the late Mr. Bentham, and is mentioned in the preface (vol. i. p. 8) to that author's *Flora Australiensis*. On the occurrence of a vacancy in 1865 Mr. Hemsley was appointed Herbarium Clerk, succeeding Mr. Alexander Smith.

A complete breakdown in health compelled Mr. Hemsley to relinquish this post in 1867, but on his partial recovery he returned to Kew in 1874 as an independent worker, and in 1883, his health having become completely restored, he re-entered the service of Kew as Assistant for India. In 1890 Mr. Hemsley was appointed a Principal Assistant in the Herbarium, and in 1899 he succeeded Mr. J. G. Baker as Keeper of the Herbarium and Library.

In certifying that Mr. Hemsley has discharged his official duties with diligence and fidelity and to their entire satisfaction, the Board of Agriculture and Fisheries have further placed on record "their appreciation of the very valuable services which Mr. Hemsley has rendered to the Royal Botanic Gardens at Kew since he became associated with that institution, now nearly 49 years ago. His constant courtesy and kindness to his colleagues, the ability which he has brought to the discharge of his duties, and his high scientific attainments have all contributed materially to the maintenance and development of the distinguished reputation which Kew enjoys both at home and abroad. The Board greatly regret that Mr. Hemsley's retirement has become necessary, but they trust that he will be spared for many years to come to continue his labours on behalf of that science with which his name is so honourably associated and towards the prosecution of which he has done so much."

On December 29th the members of the Herbarium staff handed to Mr. Hemsley the following farewell address:—"We, who have been associated with you in the Herbarium, feel that we should not allow the occasion of your retirement from the Keepership to pass without expressing our cordial goodwill and friendliness towards you. We beg to assure you of our full appreciation of the work you have accomplished and our sincere wish that you may long enjoy health to pursue those studies that have been so congenial to you in the past, and by which Botany has gained so much."

The time which has been at Mr. Hemsley's own disposal has been as fully occupied as that given by him to official duties, in valuable contributions to botanical knowledge. Among such contributions may be mentioned a share in the preparation of the *Flora of Tropical Africa*; a *Flora of Sussex*; a *Flora of Mexico*, in Salvin and Godman's "Biologia Centrali-Americana," *Insular Floras*, in the "Challenger" Reports; and works on the Flora of Afghanistan, conjointly with Dr. Aitchison, on the Flora of China, and on the Flora of Burma, conjointly with Sir H. Collett.

One of Mr. Hemsley's earliest distinctions was a first prize for Botany, awarded by the Society of Arts in 1863. He was elected an Associate of the Linnean Society in 1875, and became a Fellow in 1896. In 1889 he was elected a Fellow of the Royal Society.

The President of the Board of Agriculture and Fisheries has been pleased to appoint Dr. O. Stapf, F.R.S., F.L.S., to succeed Mr. Hemsley as Keeper of the Herbarium and Library, and to appoint Mr. C. H. Wright, A.L.S., to perform the duties hitherto carried out by Dr. Stapf.

Alexander Whyte, whose death at the age of 75 occurred at High Barnet on 21st December, 1908, was a younger son of the Rev. A. Whyte, M.A., minister of Fettercairn, Kincardineshire. Mr. Whyte was born at Fettercairn on 5th March, 1834, and was educated at the Parish School there, under Mr. (afterwards Dr.) Inglis and, after 1846, under the Rev. J. Law. He entered the University of Aberdeen in 1850, reading during vacations with Mr. (now Dr.) Cameron. During his university career he proved a proficient classical scholar and took a distinguished place in the classes of Natural History and Botany. He left for the West Indies, where his family had interests, before completing his university curriculum, and for the same reason subsequently went to Ceylon. During his residence in that island he continued to take an active interest in natural science, more particularly in Zoology, making considerable collections and latterly embarking in business in Colombo as a Naturalist. He was elected a Fellow of the Zoological Society in 1877.

Whyte returned to England in October, 1890, and in March, 1891, at the age of 57, he became attached to the staff which accompanied Mr. (now Sir) H. H. Johnston on his departure to take up the duties of Commissioner in British Central Africa.

In 1894 he became a Fellow of the Linnean Society and in the same year was made an Honorary Fellow of the Zoological Society "for services rendered to the Society," which on 16th June, 1897, awarded him their Silver Medal "in acknowledgment of valuable services rendered to Zoological Science by his researches in British Central Africa."

In 1898 Whyte's services were transferred to the Uganda Administration, and in 1902 he went as Director of Agriculture to British East Africa. He retired from Government service in 1903, but in 1904–5 he made journeys in Liberia on behalf of a company which had been granted concessions by the Government of that State.

Endowed with a robust constitution, good powers of observation and a capacity for taking pains, Whyte was an excellent collector, and his specimens illustrating the Botany of those parts of Africa in which he had travelled have proved, like his zoological contributions, to be of much interest and to include a considerable percentage of species previously unknown to science. His name in this connection is commemorated in *Widdringtonia Whytei*, the Mlanji Cypress, notices of which have appeared in this work (*K.B.* 1895, pp. 158, 199; 1896, p. 216).

Visitors during 1908.—The number of persons who visited the Royal Botanic Gardens during the year 1908 was 2,710,220. These figures shew a decrease of 252,494 visitors over the year 1907 when the number of visitors was the largest yet recorded.

During the last ten years (1898–1907) 16,428,084 persons have visited the Gardens, giving an average of 1,642,808. The total number on Sundays was 1,321,384 and on week-days 1,388,836. The number of visitors on Sundays is the largest on record, being in excess of that for 1907 by 52,883. The increase is probably very largely due to the great number of French visitors during the summer. The total number on week-days was 1,388,836, the corresponding number for 1907, 1,694,213. The maximum attendance on any one day was 98,388 on August 3rd. The smallest number on any one day was 68 on January 21st. The greatest number on a Sunday was 70,904 on July 26th and is a record number for a Sunday, shewing an excess of 5,990 visitors over the figures for 1907. The smallest number on a Sunday was 1,032 on December 6th.

The detailed monthly returns are given below :—

January	34,807
February	55,896
March	76,015
April	200,203
May	482,732
June	462,137
July	340,286
August	493,694
September	237,515
October	209,988
November	88,947
December	28,000
	2,710,220

Museums.—During the year 1908, much has been done to improve the collections in Museums I. and II., large specimens have been reduced to a minimum size to prevent over-crowding, others have been transferred to the carpological collection of the Herbarium, and much material deteriorated by age, has been replaced by fresh specimens. It was found necessary to lay new linoleum on the top floor of Museum No. I. and to provide additional accommodation for books in the Museum library.

A collection of rubbers of historical interest, together with living plants, and herbarium specimens of rubber-yielding plants, was selected and exhibited at the International Rubber Exhibition, held at Olympia, and in this connection it may be recorded that the Director of the Royal Gardens and the Keeper of the Museums were upon the Advisory Committee of the Exhibition.

An exhibit was also prepared for the Forestry section of the Bath and West and Southern Counties Show, held at Dorchester. This exhibit consisted chiefly of material from the Kew Arboretum to illustrate good and bad methods of pruning and diseases ; herbarium specimens and photographs of forest trees were also sent in addition to various specimens selected from the Museums.

During the year there were 175 contributors to the Museums including various representatives of the different sections of the

Franco-British Exhibition, the International Rubber Exhibition, and the Hungarian Exhibition. From these sources the bulk of the presentations have been received. From several exhibitors at the Dorchester Show many specimens of home-grown timber, photographs, and other material interesting in forestry have been received. These are in course of preparation as museum specimens. Many other donations of more or less interest have been recorded in the numbers of the *Bulletin* issued during the year.

All available duplicates, fully labelled, have been distributed to 48 recipients, including the Imperial College of Science and Technology, South Kensington, the Botany School, Cambridge, and Mr. A. Henry, Reader in Forestry, Cambridge University.

Much time has necessarily been devoted to supplying information upon and in determining specimens of economic products sent for name by numerous correspondents, including the Director of the Imperial Institute, the Curator of the Museum of the Pharmaceutical Society, the Director of the Colonial Museum, Haarlem, the Secretary of the London Chamber of Commerce, the Editor of the India Rubber Journal and others. In nearly 270 of these enquiries the products have been determined, and in most instances full references have been given to the literature bearing upon the subject. For several correspondents connected with Botanical Departments in the Colonies commercial opinions and advice upon products submitted have been obtained from experts.

Much work remains to be done in dealing with the large quantity of products received from the exhibitions. Other work in hand consists of the preparation of a new edition of the Guide to the Timber Museum and a list of the Useful Plants of Nigeria.

Additions to the Herbarium during 1908.—About 11,500 sheets were presented or received in exchange, while over 11,700 sheets were purchased. The principal collections are enumerated below. Except where otherwise stated or implied, the collections purchased are named, and those presented are unnamed or only partially named.

Various Parts of the World. *Presented*:—French Colonies, named, by the Natural History Museum, Paris; named Gossypium, by Sir G. Watt, C.I.E.; named Aconitum, by the Royal Botanic Garden, Calcutta; named Bamboos, by Mr. J. H. de Lehaie; various named plants, by the Botanical Museum, Copenhagen; "Bryotheca exotica," cent. i., by Dr. E. Levier.

Purchased:—Kneucker, "Gramineae Exsiccatae," lief. xxiii.—xxiv.

Europe. *Presented*:—"Kryptogamae Exsiccatae," cent. xv.—xvi., by the Imperial Natural History Museum, Vienna; British seeds, by Mr. Clement Reid; critical British plants, by Mr. C. E. Salmon; named British marine Algae, by Mr. A. D. Cotton; named Greek plants, by Mr. M. Petitmengin.

Purchased:—Schneider, Balkan Peninsula; Fiori, Béguinot and Pampanini, "Flora Italica Exsiccata," cent. v.—vi.; Dahlstedt, "Herbarium Hieraciorum Scandinaviae," cent. xxi.—xxii.; Sydow, "Mycotheca germanica," fasc. xiv.—xv.

North Africa and Orient. *Presented :*—Algeria, named, by Mr. M. Petitmengin ; Eastern Caucasus, by Mr. St. G. Littledale ; Cyprus, by Mr. Clement Reid.

Purchased :—Murray, Canary Islands ; Gandoger, Tunisia.

Eastern Asia. *Presented :*—Forrest, Yunnan, by the Royal Botanic Garden, Edinburgh ; named Ferns, by Fleet-Surgeon C. G. Matthew.

Purchased :—Terasaki, Tokyo ; Monbeig, Yunnan, unnamed.

India and Malaya. *Presented :*—India and Thian Shan, by Lieut.-Col. H. Appleton ; Lhasa and Sikkim, by Lieut.-Col. L. A. Waddell, C.B., C.I.E. ; various named plants, by Lieut.-Col. D. Prain, C.I.E. ; Mosses, by Mrs. Prain ; Mysore, by Mr. A. Meebold ; Malay Peninsula, by the Botanic Gardens, Singapore ; named Laos Apocynaceae, by Mr. M. Petitmengin ; G. D. Haviland, Borneo, by Mr. J. H. Haviland ; Sarawak, by Mr. J. Hewitt ; Williams, Philippines, named, by the New York Botanical Garden ; Philippines, by the Bureau of Science, Manila ; Nepenthes, named, by the Royal Botanic Garden, Calcutta ; Ferns, named, by Fleet-Surgeon C. G. Matthew.

Purchased :—Elmer, Philippines.

Australasia. *Presented :*—Australia, by Dr. W. H. Ince ; New South Wales, named, by the Hon. J. H. Carruthers ; South Australia, named, by Miss E. J. Benham ; types of his new Queensland species, by Mr. F. M. Bailey ; Polynesian Selaginellae, by the Botanic Gardens, Sydney ; Smith, New Zealand marine Algae, by Mr. R. H. A. Shakespear.

Purchased :—Schlechter, New Caledonia.

Tropical Africa. *Presented :*—Sierra Leone, by Mr. C. W. Smythe ; Gold Coast, by Mr. H. N. Thompson ; S. Nigeria, by Mr. E. W. Foster, and by Mr. H. Dodd ; Dalziel, N. Nigeria, by the Imperial Institute ; N. Nigeria, by Dr. A. C. Parsons ; Rudatis, Cameroons, by Dr. H. Schinz ; Angola, by Dr. F. C. Wellman ; S. W. Africa, by Mr. E. E. Galpin, and Prof. H. H. W. Pearson ; British Somaliland, by Dr. R. E. Drake-Brockman ; Uganda, by Mr. C. B. Ussher ; Zanzibar, by Mr. J. T. Last ; Mozambique, by the Companhia de Moçambique ; Portuguese East Africa, Fungi, by the Transvaal Department of Agriculture ; named Apocynaceae and Myristicaceae, by the Royal Botanic Garden, Berlin.

Purchased ;—Zenker, Cameroons ; Scheffler, East Africa.

Mascarene Islands. *Presented :*—Seychelles, by Mr. J. Stanley Gardiner ; Mauritius, by the Governor of Mauritius ; types of new species from Madagascar, by Prof. H. Jumelle.

South Africa. *Presented :*—Cape Colony, named, by Dr. H. Bolus ; Gardner, Cape Algae, by Mr. E. M. Holmes ; S. Africa, named, by Dr. Hans Schinz ; Transvaal, by the Transvaal Department of Agriculture, and by the Transvaal Museum ; Thymelaeaceae, by the South African Museum, and by Mr. T. R. Sim.

North and Central America. *Presented :*—Western United States, by the United States National Museum ; Polyporeae, by Mr. W. A. Murrill.

Purchased :—Macoun, Canadian Mosses, cent. i.—ii. ; Palmer, Mexico ; Tonduz, Costa Rica, unnamed.

South America. *Presented* :—British Guiana, by the Botanic Garden, Georgetown; Brazil and Patagonia, by Dr. P. Dusèn.

Purchased :—Lehmann, Colombia, unnamed; Fiebrig, Paraguay and Bolivia; Ule, Bahia; Museo Goeldi, Amazons; Schroeder, S. Brazilian Pteridophyta.

An important acquisition was the Canary Islands herbarium of the late Rev. R. P. Murray. This is estimated to contain about 1,000 sheets, exclusive of duplicates, and will usefully supplement the older collections from the same group.

The Asiatic plants formed an unusually large proportion of those received during the year, and included over 2,000 sheets from the Philippines, 900 from Borneo, and 800 from Yunnan.

The botanical collections formed in the Seychelles during the "Sealark" Expedition, 1908, were communicated by Mr. J. Stanley Gardiner. They are estimated to include about 1,100 specimens, and should add considerably to our knowledge of the flora, when they are worked out.

Fewer African plants were received than has been usual of late years, but several of the collections were from less-known parts of the Continent. Among the more important was a set of over 400 numbers collected by Dr. J. M. Dalziel in the Katagum District, Northern Nigeria, and one of 360 numbers collected on Zanzibar Island by Mr. J. T. Last.

Research in Jodrell Laboratory in 1908:—

Boodle, L. A.—On the Production of Dwarf Male Prothalli in Sporangia of *Todea*. (Ann. Bot., Vol. XXII., pp. 231–243, t. 16.)

Boodle, L. A.—On the Occurrence of different Types of Hair in the Wallflower. (Ann. Bot., Vol. XXII., pp. 714–716, with one Fig. in text.)

[**Boodle, L. A.**]—Raffia fibre from Madagascar. (Kew Bull., 1908, pp. 207–208.)

Massee, G.—"Die-back" of Peach Shoots. (Kew Bull., 1908, pp. 269–271, with one plate.)

[**Massee, G.**]—Hollow Potatoes. (Kew Bull., 1908, pp. 139–140, with one Fig. in text; Journ. Board Agric., Vol. XV., pp. 287–288.)

[**Massee, G.**]—"Corky Scab" of Potatoes (*Spongospora scabies*, Mass.) (Journ. Board Agric., Vol. XV., pp. 592–599, with one plate.)

[**Massee, G.**]—The South African Locust Fungus. (Kew Bull., 1908, pp. 197–198.)

Massee, G. and Theobald, F. V.—The enemies of the Rose. (The National Rose Society, 1908, 84 pp., tt. 1–8, and Figs. 1–4). Fungus enemies by G. Massee, Insect enemies by F. V. Theobald.

Worsdell, W. C.—A Study of the Vascular System in certain Orders of the Ranales. (Ann. Bot. Vol., XXII., pp. 651–682, tt. 32–33, with four Figs. in text.)

Worsdell, W. C.—Internal Phloem in *Myristica*. (Ann. Bot., Vol. XXII., pp. 526–527, with two Figs. in text.)

Worsdell, W. C.—The Affinities of *Paeonia*. (Journ. Bot., Vol. 46, pp. 114–116.)

Mr. L. A. Boodle began an investigation on the hairs of certain *Cruciferae*, relating to the distribution of different types of hair, where more than one type is found in the same individual or species. Mr. Boodle also studied a remarkable insect-gall in an Indian grass, and made experiments on the extraction of rubber from tubers of *Raphionacme utilis* (Kew Bull., 1908, pp. 306–307), and continued some investigations on abnormal leaves of *Pinus* and other subjects : see above.

Miss E. M. Delf began a study of the ovule, embryo-sac, &c., in some members of the *Elaeagnaceae* and *Lauraceae*.

Mr. W. E. Hiley, in collaboration with Mr. L. A. Boodle, spent a short time in completing the work begun in 1907 on the vascular anatomy of some species of *Gleichenia*.

Mr. A. W. Hill carried out an investigation on the floral structure and biology of certain members of the *Gentianaceae*.

Dr. A. A. Lawson continued his researches on the morphology of the Gymnosperms, in which he deals more especially with the gametophytes, fertilisation and embryo. A piece of work on *Pseudotsuga* was completed, and Dr. Lawson also carried on a cytological investigation on one of the *Liliaceae*.

Mr. A. J. Maslen investigated the structure of *Poroxylon Sutcliffii*, a fossil stem from the English Coal-Measures, in continuation of the observations already made by Dr. D. H. Scott.

Dr. A. D. Waller, Mrs. A. D. Waller and Miss H. P. Kemp carried out a research on the conduction of stimuli in plants, the transference of the stimuli being tested by electrical methods.

Mr. W. C. Worsdell continued his work on Vegetable Teratology, and his investigations on the Vascular Anatomy of the Dicotyledons, and, in the latter subject, devoted his attention chiefly to the Ranales. Mr. Worsdell also made a special study of the rhizophores of *Selaginella* with regard to the morphological nature of these organs : see above.

Pathology.—The number of reports issued during 1907, dealing with plant diseases, was more than three times the number issued during the previous season. Those dealing with " Black Scab " of potatoes alone exceeded the total annual number of reports on every subject prepared a few years ago. American Gooseberry Mildew also monopolised a considerable amount of time, and when present only in the conidial condition necessitates very careful examination to distinguish between this and the conidial form of the European Gooseberry Mildew, as the two are frequently present on the same shoot. Two diseases of potatoes not previously recorded in Britain as epidemics, although known on the Continent and in Ireland, have been discovered on potatoes from Scotland and England sent to Kew for investigation. These are " Corky Scab " (*Spongospora solani*), and " Dry Scab " (*Spondylocladium atrovirens*).

Some field experiments bearing on the deterioration of potato tubers have been conducted during the past year, and will be continued next season.

A statement appeared in *The Agricultural Journal of the Cape of Good Hope*, XXII., p. 152, that spraying with a solution of arsenite of soda killed dodder (*Cuscuta*) parasitic on alfalfa without in any way injuring the latter. Plots of alfalfa, red clover, and white

clover respectively, each supporting a luxuriant growth of two kinds of dodder—*Cuscuta trifolii* and *C. Tinei*, an exotic species—were sprayed with a solution of arsenite of soda, according to directions. Two days after the first spraying, both kinds of clover and the alfalfa were thoroughly bleached and dead. The parasite soon after died from starvation. The above experiment proves that arsenite of soda cannot be used to exterminate dodder in this country.

Diseased material from various British colonies and dependencies, and other exotic sources have been received for examination at Kew.

Botanical Magazine for January.—The new volume begins with a plate of *Encephalartos Barteri*, Carruth., a West Tropical African Cycad, of which living plants and fresh female cones were sent to Kew early last year by Mr. J. Anderson, Curator, Agricultural Department, Gold Coast. In West Africa the plant is known as the Pardi Attar or "Ghost Palm," and it was first discovered by Barter during Baikie's Niger Expedition of 1858. This species has only once produced a cone under cultivation at Kew, where it does not thrive like other members of the genus. *Angadenia nitida*, Miers, is an Apocynaceous climbing shrub with sulphur-yellow flowers having a vermilion band on the corolla-tube. It is a native of Tropical South America, and was received at Kew in 1906 from the Trinidad Botanic Gardens. The Javan *Eria rhynchostyloides*, O'Brien, has small white flowers with a purple column, borne in dense curved racemes. The plant figured was presented in 1908 by the Hon. Walter Rothschild, and it is that upon which Mr. O'Brien based his description. *Clerodendron ugandense*, Prain, is a new species closely allied to *C. myricoides*, R. Br., figured at t. 5838 as *Cyclonema myricoides*, Hochst. As implied in the name, it is a native of Uganda, whence seeds were sent in 1906 by Mr. M. T. Dawe, who collected them in Voi, at 2000 ft. above sea-level. Its large violet-blue flowers render it an attractive autumn- or winter-flowering greenhouse shrub. The pretty *Lonicera Giraldii*, Rehder, is a recent introduction from Szechuen, Western China, seeds having been sent to Mr. M. L. de Vilmorin in 1899. The drawing was made from material supplied by Mr. M. L. de Vilmorin. The species is allied to *L. acuminata*, Wall., from which it may be distinguished by the somewhat narrower leaves which are clothed on both sides with a dense yellowish somewhat stiff indumentum.

Australian Saltbushes.—In the *Kew Bulletin*, 1896, p. 129, an account is given of sheep-bushes and saltbushes in various parts of the world. Mr. Fred Turner, F.L.S. has forwarded to the Director of Kew an article on the Australian saltbushes which was published in the "Sydney Morning Herald" of June 20th, 1907. The article deals with the various species of *Atriplex*, *Chenopodium*, *Kochia* and *Rhagodia* which are found to be of considerable value as pasture plants in Australia. The following extracts have been taken from Mr. Turner's account. In the course of this

article Mr. Turner states that many pastoralists profiting by previous mistakes, are now fully convinced of the necessity of conserving these valuable forage plants, which have provided such excellent feed for stock during adverse seasons, and several experienced graziers are even going so far as to cultivate them. A good percentage of saltbushes in the pastures enhances the grazing capabilities of the country, and keeps stock in a healthy condition; moreover, their succulent stems and leaves assuage the thirst of the animals that browse upon them—a most important consideration in country where water is scarce. The plants are easily raised from seed, and may be increased by cuttings, so that there are no insurmountable difficulties in the way of re-establishing this valuable pasture herbage on those areas from which it has been eaten out after years of persistent stocking. With regard to *Atriplex semibaccata* the following statement is quoted from the report of the American Agricultural Experiment Stations:—"This plant has proved most valuable in some of the worst alkali spots of California. The full crop of a field is about 20 tons of green material, or, calculating on the basis of 75 per cent. of water, 5 tons of dry matter per acre. A good season would permit of two such crops. It seems to be already demonstrated that this Australian species of *Atriplex* will constitute itself a most important industrial factor in this State, and will render productive vast tracts of land which are at present a blot on the landscape. This important saltbush might be planted to advantage on some of the 'scalded' plains in the interior, and thus they would be covered with herbage and rendered productive much sooner than under natural conditions."

Under the genus *Chenopodium* Mr. Turner refers particularly to three species. The "blue bush," *C. auricomum*, is a superior forage plant found on the inland plains, where it often grows 5 ft. high or more. Its stems are clothed with almost triangular-shaped leaves from 1 in. to 2 in. long, and it is easily recognised on the plains by its almost golden hue—hence its specific name *auricomum*. Sheep and cattle are particularly fond of it, and stockmen speak very highly of it, both for its nutritive properties and its wholesome qualities. The succulent stems and leaves of this "blue bush," for there are others, are an excellent table vegetable when cooked and served in a similar way to spinach. The "goosefoot saltbush," *C. atriplicinum*, rarely grows more than 1 ft. high, but it branches freely from its thick base, and often forms a dense mass of nutritious succulent herbage, much relished by all herbivora. Its tap-like root penetrates deeply into the earth, and in consequence the plant is often green when the surrounding herbage is brown. The "nitre bush," *C. nitrariacea*, is a branching undershrub of from 3 ft. to 4 ft. in height, though under cultivation it grows 8 ft. high and 6 ft. in diameter. It is fairly common on some of the inland plains, and sheep in eating this bush often trim it as neatly as if it had been clipped with hand-shears. It withstands a lot of dry weather, and no matter how closely it is cropped soon puts forth new growth.

The genus *Kochia* includes fifteen known species. One of the best and most favourably known to stock owners is the "cotton bush" (*Kochia aphylla*), so called from the woolly-like galls which form on the plant during periods of prolonged dry weather, and

which are generally supposed to be caused by some insect. The "cotton bush," which grows from 2 ft. to 3 ft. high, occupies large tracts of country in the interior, and its presence is nearly always an indication of good grazing land. Stock of all kinds are remarkably fond of this plant, on which they thrive and fatten. In dry seasons on some stations quantities of it are cut and chaffed before being fed to stock. The chaffed material after being cut a few days has a perfume like new mown hay. Sometimes "cotton-bush" is chaffed with "mulga" (*Acacia aneura*) and "belar" (*Casuarina glauca*), and horses and bullocks are said not only to work well but to fatten on this feed. In any system of conservation of saltbushes this shrub should be amongst the first to receive attention. The "grey bush" (*K. pyramidata*) is a many-branched shrub, growing 3 ft. high or more. The whole plant is covered with a soft tomentum of a greyish colour, hence stockmen called it "grey bush." It occurs over an immense area in the interior, and is quite a feature on some of the plains. This saltbush generally grows on good land, and it is probably on that account that it thrives during prolonged dry weather. Sheep are particularly fond of this plant, and analysis shows that it possesses good feeding value.

Most of the species of the genus *Rhagodia* are excellent forage plants, the tallest being *R. parabolica*, which sometimes attains a height of 15 ft. Two of the dwarfest species of this genus are the "flax-leafed saltbush" (*R. linifolia*) and the "nodding saltbush" (*R. nutans*) and they are found both in the coastal districts and in the interior. Sheep are particularly fond of and thrive on their slender, herbaceous stems. The "halbert-leaved saltbush" (*R. hastata*) grows from 2 ft. to 3 ft. high in a natural state, but attains a height of 5 or 6 ft. under cultivation. This is the saltbush that is so largely grown as a hedge plant, for which purpose it is admirably adapted, as it will withstand any amount of clipping without injury. In the interior, sheep, when eating the succulent stems and foliage of this plant, often trim it as neatly as if it had been clipped into shape by hand-shears.

There are very few members of the saltbush family that are not suitable for forage purposes, though exception may be taken to those species whose stems, leaves, and fruit are enveloped in a cottony or woolly substance, for sheep have died after eating too freely of this indigestible stuff together with parts of the plants. The dorsal spines on the fruits of all species of the genus *Anisacantha* cause some trouble to the salivary glands of sheep and other small herbivora if they eat too much of the plants when the fruits are near maturity. Stock, however, eat most of these saltbushes without any serious consequences when the stems and leaves are young and succulent. *Anisacantha muricata*, when dry, makes the troublesome "roley-poleys" which the wind occasionally blows over some of the inland plains to the consternation of horses and cattle. Stockmen call the ripe fruits of the various species of *Anisacantha* "bindyhies," and they are often a terror to those who camp out in country where the plants that produce them grow. Once these fruits, with their adherent spines, get into a blanket, they can rarely be removed.